Agenda

- SPECIES meeting opening - Prof. Tullio Tolio
- A Unified Manufacturing Resource Model for CNC Machining Systems
  Prof. Stephen T. Newman (University of Bath)
- Flexible Integrated and Autonomous Machining Systems for the Aerospace Industry - Dr. Giuseppe Fogliazza (MCM SpA)
- 21st Century Challenges for the Digital Enterprise - Dr. Carl Bouffiou (BOEING Company)
- AIRBUS PLM A350 Manufacturing Engineering Strategy - Dr. Jean-Bernard Hentz (AIRBUS Company)
- Closure of SPECIES - Prof. Tullio Tolio
- Concluding Remarks - Prof. Tullio Tolio
Meeting Opening

AGENDA

➢ Opening, welcome, introduction of invited guests
➢ Approval of the agenda
➢ Approval of the minutes
➢ About “SPECIES-Product, on System Evolution”
➢ Organized activities
➢ Web-site
Changes in Products
- Technological features
- Material
- Part-mix modification
- Variation in the production ratios

Changes in Processes
- New Technologies
- Traditional process improvement
- Pro-environmental legislation

Changes in Production Systems
- Machine architectures and technologies
- System architecture and system layout
- Man-machine interaction
- Production planning and Control
- Quality control
- Interaction with the Environment

THE VISION
Open Issues

- Characterization of evolution scenarios for products/processes and production systems (Scenario analysis);
- Formalization of information characterizing the link between products/process and production systems;
- Economical analysis of changeability and reconfigurability at a production system level (Protection of investments);
- Configuration/Reconfiguration planning under uncertainty;
- Influence of production system evolution on manufacturing strategy;
- Filling the gap between the inertia of production systems and the frequency of change of products/processes and manufacturing strategies (co-evolution).
The **Mission** is to investigate approaches, techniques and methods devoted to determine the most appropriate evolution strategy for a production system, grounding on knowledge about competitive environment changes, with a particular focus on evolving product and process characteristics.

**AGENDA**

**ABOUT “SPECIES-**

**Production System**

**Evolution”**

**ORGANIZED EVENTS**

**TOOLS**
Proposal for the Co-evolution Model of Product, Process and Production System to be adopted by the STC O&A Da CIRP Working Group SPECIES – Production System Evolution

Abstract

The document describes the Co-evolution Model of products, processes and production systems that is a general framework to be adopted by the SPECIES – Production System Evolution CIRP Working Group. It has been developed with the objective of formulating knowledge and sharing a common vision among the participants in the Working Group activities. In the document, the logical path that has been followed to better define the content of the problem, through the analysis of a larger number of real cases, is described. Furthermore, several sections of the framework are introduced and the model is presented in detail. Moreover, a matrix for positioning the configuration approaches and problems in the framework is proposed. Some examples of positioning of existing products, processes and production systems configuration approaches as the framework are presented, in order to show the applicability and the genericity of the proposed model.

1. Introduction

The document presents a proposal for the general framework of the Working Group SPECIES – Production System Evolution. Indeed, at the beginning of the Working Group activities, it was very important to share a common vision among the participants concerning the topics to be handled during the life of the Working Group. In this respect, the framework is just a first draft proposal. Contributions in defining, validating, improving and consolidating the framework are welcome from the Working Group participants.

The mission of the working group activity has been presented by the Working Group leader Prof. Tullio during the opening meeting in Paris, in January 2006.

The mission is to investigate approaches, techniques and methods directed to determine the most appropriate strategic level for a production system, focusing on knowledge about competitive environment changes, with a particular focus on evolving products and process characteristics.

In order to achieve these goals relevant research topics have been identified, among which:

- the characterization of evolution scenarios for products, processes and production systems;
- the formalization of information characterizing the link between products, processes and production systems;
- the analysis of the influence of the production system evolution on the manufacturing strategy.

DRAFT VERSION
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Contributions in improving and sharing the model are needed

http://www.species.polimi.it
Development of a Conceptual Reference Framework to manage manufacturing knowledge related to Products, Processes and Production Systems, considering their Co-evolution

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1.1 Introduction

The Manufacturing sector is nowadays characterized by a continuously increasing level of complexity, basically due to the large number of requirements that must be met at a production level and to the presence of many different sources of information in the market. This high level of complexity affects both the physical and the architectural aspects of the manufacturing companies, together with the management, financial and organizational aspects. The increasing complexity of production requirements and environment complicates the problems of configuration, reconfiguration, implementation, management, control and continuous improvement of products, processes and production systems.

To manage such complexity, it is necessary to capture the most important relationships among the different objects composing the overall system, by adopting an holistic and highly integrated view. For this purpose, knowledge-based analysis methodologies and tools have been developed by system engineers to support the decision-making processes all over the product/process/system lifecycles. However, depending on the lifecycle phase in which each decision takes place, different levels of detail of the required and available information are needed. Therefore, the methodologies and tools developed to support such decision-making processes must be tuned to these different needs.

In the phase of production system configuration starting from "green field", for instance, very aggregate information on the production requirements and on the capabilities are available. At this point, exact analytical techniques [1, 2] are very frequently used to support the decision-making process; these techniques require very few and aggregate informations on product, process and production systems to provide general configurations that are suitable enough to meet production requirements.

On the other hand, approximate analytical techniques [1, 2] fit better with the problem requirements during the phase of detailed system reconfiguration, when some knowledge concerning the system dynamics and unexpected events affecting performances is already available. This kind of techniques need more precise information concerning the dynamic behavior of the system and the new
The production system design approach

Contributions in improving and sharing the model are needed

http://www.species.polimi.it
DESIGN OF FLEXIBLE PRODUCTION SYSTEMS

METHODOLOGIES AND TOOLS

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Contacts

If you are interest in SPECIES-WG topics and you want to learn more information, feel free to contact us:

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http://www.species.polimi.it
The **AERONAUTIC PRODUCTION CONTEXT** represents a meaningful example of **Co-Evolving Product/Process/Production Network**

![Diagram of an aircraft showing various components such as Machined Part, Sheet Metal Part, Composite Part, Electrical System, Tubing, Ducting, Standard Part, Structures, Payloads, Propulsion, and Systems.]
Aeronautic Production Context

Evolving Production System

- Evolving Product
- Evolving Process

- New materials
  - Composites
  - Titanium alloys
  - Aluminum Sheets
- New complex shapes
Evolving Production System

- New technologies
  - Laser welding
  - Super-plastic forming
  - Friction stir welding
  - Filament winding
  - Resin transfer molding
  - Resin infusion

- New regulation constraints
  - Low percentage of material waste
  - Low carbon emission - carbon footprint
Aeronautic Production Context

- New machine architectures and performance
  - High power motors
  - Low spindle speeds
- New system architectures
  - Highly flexible systems for component manufacturing
DET - Digital Enterprise Technologies
to support the production over the world

[Digital Planning Validation in automotive industry
Woehlke G and Schiller E
Computers in Industry, 2005]